DEEP VEIN PULSATOR LEGGINGS

This invention relates to reducing the incidence of deep vein thrombosis. That is the formation of blood clots in the veins and arteries of the lower legs of the human body caused by long periods of inactivity such as sitting in an aircraft for long periods of time, or convalescing in a wheelchair or bed during post operative care after an operation, or long periods of hospitalisation.

The lack of movement of the human body over extended periods of time, when the body is in an upright sitting position will cause the circulation of the blood within the lower extremities, that is the lower leg and upper thigh areas to slow down to such a degree that the body's own blood pressure can no longer continue to clear the veins and arteries within the venus return system in the leg adequately enough to keep the venus return system clean.

The resulting effect can cause the build up of blood within the venus return system to congeal into blood clots. These clots are called thrombic clots or plugs which then can be dislodged to travel through to other parts of the body with the potential to cause life threatening situations or death.

The action necessary to prevent the formation of thrombic clots is to apply a systemic sudden and rythmic sequential pressure wave to the area of the lower limbs between the ankle and knee beginning at the ankle and working up towards the knee. This pressure wave action will result in vacating the venus return system by driving the blood up the venus return system past the knee and into the groin area where the body's own cardiovascular system can readily accommodate the blood flow once more. This action mimics part of the action of the calf muscle of the lower leg when a person is mobile. The calf muscle will exert pressure on the venus return system in such a way as to assist in the blood circulation of the lower limbs, when a person is standing or walking or in any way active in an upright position.

To assist in the understanding of this invention, reference will now be made to the accompanying drawings which shows the portable example of this invention with the power source attached to a waist belt by the operator as used in a mobile situation.

Figure 1 Shows the complete assembly as could be worn by an operator. This assembly shows the waist belt and buckle 1. The power source complete in its own housing 2 attached to the waist belt 1. The air supply lines 3 connecting the power source to the left and right leg sleeves 4. The sleeve tensioning straps 5 are used to adjust the sleeves to fit the user's leg shape.

Figure 2 Shows the power source housing assembly with the necessary components fitted and contained within the housing. The start / stop control switch 6 used to activate the power source at will. The D.C. power source pack 7 supplies power to the unit. The printed circuit control board 8 which controls all the necessary functions of the unit. The miniature compressor 9. The air supply lines 10. The two controlling solonoid valves 11 which are connected to the left and right air supply plug outlets 12.

Figure 3 Shows the cutaway section of the bladder section 13 of the compression sleeve 4 as shown thus when the compression sleeve 4 is actually under compression. The air supply supply line 3 supplies compressed air from the air supply outlets 12 to the compression sleeve 13 via the connecting button 15 which is attached to the compression sleeve. The direction of inflation of the compression sleeve 13 is indicated by the directional arrows 16.

Figure 4 Shows the cutaway section of one of the leg sleeves 4 showing the bladder section in a fully deflated position

Figure 5 Shows the same cutaway section as in Figure 4, but with the bladder partially inflated .

Figure 6 Shows a cross section of the bladder partially inflated. The bladder is constructed in segments, with each segment connected to each other by pressure tubes. These tubes control the inflation action by allowing the lowest or first segment 13-A to pressurise before the next segment is allowed to become pressurised. In the partially inflated position at point pressure point "A" , the pressure is greater than the pressure as indicated at pressure point "B", of segment 13-B which in turn has a pressure greater than the pressure as indicated at pressure point "C" of segment 13-C. This action will sequentially only allow the bladder to pressurise from the bottom up.

The compression sleeve 4 consists of an outer flexible casing that is constructed in such a way as to be able to be fitted to the calf area of the human leg, and is able to be worn comfortably for extended periods of time. To assist in the wearer's comfort , a set of adjusting straps 5 fitted to the front section of the sleeve 4 can be adjusted to fit the wearer's individual requirements. Encased within the compression sleeve 4 as shown in Figure 4 is a flexible bladder 13 that is designed to inflate inwards as indicated by the arrows 16. The flexible bladder 13 is also designed to inflate sequentially beginning from the extreme lower section of the compression sleeve 4. The flexible bladder 13 is inflated by the miniature air compressor 9 via the air supply lines 3 and activated by solonoid valves11 which are controlled by the printed circuit control board 8.

When the apparatus is worn and in use the following action is described thus.

The deep vein pulsator legging apparatus is designed to mimic part of the action of the calf muscle when a person is mobile or standing in an upright position. This action is responsible for assisting the cardio vascular system to continue rhythmic pumping out of the venus return vein and artery system thereby eliminating a buildup of low oxygenated blood, which has the capacity to develop into blood clots which can further form into larger clots called thrombic clots.

Now when the deep vein pulsator apparatus is fitted and worn as indicated by the layout in Figure 1, the apparatus is now ready to be used.

To operate the unit, press the start button 6 located on the power source 2 which is connected to the waist belt 1. This action powers up the unit by releasing direct

current power from the direct current power source 7 into the printed circuit control board 8 which has a built in timer as part of the circuitry . The timer in turn activates the miniature air compressor 9 which then begins to inflate the leg sleeve assembly 4 via the air lines 3 to a predetermined pressure which is controlled be a miniature air pressure regulator contained within as part of the printed circuit board 8, At an interval also controlled by the printed circuit board 8, the two solonoid valves 11 are then activated to release the pressure within the leg sleeves 4 by allowing the air that is contained within the leg sleeve assembly 4 to escape into the atmosphere. This action is then repeated for as long as necessary by the wearer.

Figure 6 shows a cross section of the bladder section 13 containing only a three section bladder as part of a leg sleeve assembly 4, which has just begun a compression cycle. The actual number of bladder sections will depend on the size of the leg assembly required by each individual person. This illustration clearly shows that when the leg sleeve assembly is pressurised, the bladder 13 will begin to inflate from the low section up in stages. The first section of the bladder 13-A of Figure 6 will pressurise to the maximum desired pressure which will then allow the next segment that is segment 13- C to inflate to the maximum desired pressure, which in turn when the desired pressure is reached will then allow the final segment that is segment 13-C to become fully pressurised. This action is then repeated up the sleeve until the total number of segments are fully pressurised in one sequentious movement.

The sleeves will have exerted an inward pressure as shown in Figure 3 and figure 6, acting upon the surface area of the lower leg, completely covering the calf area itself, with the pressure being transmitted through the muscle and tissue area travelling inwards to the centre of the leg.
The complete leg assembly has now become fully pressurised, with the timing controlled by the printed circuit board 8, the solonoid valves 12 are then activated to release the air pressure contained within the leg assembly 4 , which in turn will reduce the pressure in the leg air to normal once more.

This action will have the desired effect on the leg area, that is the leg area between the ankle and the knee, which can be described as a sequential travelling pressure wave in the leg beginning at the ankle, and travelling upwards within the leg muscle and tissue mass to the knee, resulting in the involuntary pressure of the venues return veins and arteries, as a travelling pressure wave, thereby resulting in the purging of blood that is contained within the venues return system upwards towards the upper part of the leg, that is the leg area past the knee, and into the groin, to be accommodated by the body's own cardiovascular system

This action is repeated in a constant rhythmic motion in both the left and right legs alternately as an ongoing action, which will assist in preventing the onset of a medical condition commonly known as Deep Vein Thrombosis.